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FORM PTO-1390 (REV. 5-93) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		CASE NO. 11284/3 U.S. APPLICATION NO. (If known, see 37 C.F.R 1.5) 10/030511
INTERNATIONAL APPLICATION NO. PCT/ SE00/00738	INTERNATIONAL FILING DATE April 18, 2000	PRIORITY DATE CLAIMED April 19, 1999
TITLE OF INVENTION METHOD AND DEVICE FOR CLEANING AND DISINFECTING TREATMENT OF WATER		
APPLICANT(FOR DO/EO/US ANDERS LUNDQUIST		

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a FIRST submission of items concerning a filing under 35 U.S.C. 371
2. ☐ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371
3. ☐ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☐ A copy of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☒ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)) and/or amendments under Article 34.

Items 11. to 16. Below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information: Reply to Written Opinion and Amendment of Claims Under Article 34

00757
PATENT & TRADEMARK OFFICE

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.50) 10/030511	INTERNATIONAL APPLICATION NO. PCT SE 00/00738	CASE NO. Error! Reference source not found.11284-3

17.☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
Basic National Fee (37 CFR 1.492(a)(1)-(5)): Search Report has been prepared by the EPO or JPO $890.00		
International preliminary **examination** fee paid to USPTO (37 CFR 1.492(a)(1)) $710.00		
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international **search** fee paid to USPTO (37 CFR 1.492(a)(2)) $740.00		
Neither international preliminary **examination** fee (37 CFR 1.482) nor international search fee (37 CFR 1.492(a)(3)) paid to USPTO..... $1,040.00		
International preliminary examination **fee** paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) $100.00		
ENTER APPROPRIATE BASIC FEE AMOUNT	$740	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)).		

Claims	Number Filed	Number Extra	Rate		
Total Claims	7- 20 =	0	x $ 18.00	0	
Independent Claims	1- 3 =	0	x $ 84.00	0	
Multiple dependent claim(s) if Applicable)	1	1	+ $280.00	280	
			TOTAL OF ABOVE CALCUATIONS =	$1,020	
Reduction by ½ for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28)				$510	
			SUBTOTAL =	$510	
Surcharge of $130.00 for furnishing the English translation later than the ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				$	
			TOTAL NATIONAL FEE=	$510	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31), $40.00 per property +					
			TOTAL FEES ENCLOSED=	$510	
				Amount to be refunded	$
				charged	$

a. ☒ A check in the amount of $510 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. 23-1925 in the amount of $ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 23-1925. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

Send All Correspondence to:
Brinks Hofer Gilson & Lione
P.O. Box 10395
Chicago, IL 60610

F. David AuBuchon
Signature
F. David AuBuchon
Name
Reg. No. 20,493
Registration Number

Rev. Oct.-01
Document1

Our Case No. : 11284/3

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Aners Lundquist)
)
)
)
Serial No.)
)
Filing Date: October 19, 2001)
)
For METHOD AND DEVICE FOR)
CLEANING AND DISINFECTING)
TREATMENT OF WATER)

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

This is a PRELIMINARY AMENDMENT being filed with the Nationalization of PCT/SE00/00738 in the United States of America under 35 U.S.C. 371.

In the Claims:

Cancel claim 3.

Amend claims 2 and 4 as follows:

2. Method according to claim 1, characterized in that the water is brackish or fresh water.

4. Device for realization of the method according to claim 1 or claim 2, characterized in that it includes:

- a source of a rectified pulsating magnetic field; and

- a conducting element, which lacks any significant ability to release silver during use of the device and which is arranged in the pulsating magnetic field such that an electric field is produced around the conducting element by electromagnetic induction during use of the device; and

- a device for changing the direction of the pulsating magnetic field in a time-dependent manner.

REMARKS

Claim 3 has been cancelled and claims 2 and 4 have been amended to accommodate for the cancellation of claim 3 and to place them in better form. This application now contains claims 1, 2 and 4-7.

Dated: October 19, 2001

Respectfully submitted,

F. David AuBuchon
Reg. No. 20,493
Attorney for Applicant

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
Chicago, Illinois 60610
(312) 321-7738

APPENDIX for Preliminary Amendment for the Nationalization of PCT/SE00/00738; Attorney docket 11284/3

In the claims:

Cancel claim 3:

Amend claims 2 and 4 as follows:

2. (amended) Method according to claim 1[any of the preceding claims], characterized in that the water is brackish or fresh water.

4. (amended) Device for realization of the method according to claim 1 or claim 2[any of claims 1-3], characterized in that it includes:

- a source of a rectified pulsating magnetic field; and
- a conducting element, which lacks any significant ability to release silver during use of the device and which is arranged in the pulsating magnetic field such that an electric field is produced around the conducting element by electromagnetic induction during use of the device; and
- a device for changing the direction of the pulsating magnetic field in a time-dependent manner.

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail, with sufficient postage, in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231, on

February 20, 2002
Date of Deposit

F. David AuBuchon
Name of Applicant, Assignee or Registered Representative

Signature

February 20, 2002
Date of Signature

Our Case No. : 11284/3

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Anders Lundquist

Serial No. 10/030,511

Filing Date: October 19, 2001

For METHOD AND DEVICE FOR CLEANING AND DISINFECTING TREATMENT OF WATER

SECOND PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

This is the second PRELIMINARY AMENDMENT being filed in this application.

In the Specification:

Please add the following paragraph on page 1, immediately following the title "Method and device for cleaning and disinfecting treatment of water":

This application is a nationalization of and claims priority under PCT Application No. PCT/SE00/00738 that was filed on April 18, 2000. This application was published, in accordance with PCT Article 21(2), in the English language as WO 00/63124 on October 26, 2000. PCT Application No. PCT/SE00/00738 claimed priority under Swedish Patent Application No. 9901377-3 that was filed on April 19, 1999.

REMARKS

A reference to the claim of priority under PCT Application No. PCT.SE00/OO738 and the Swedish Patent Application No. 9901377-3 that was filed on April 19, 1999 is hereby set forth on page 1, of the specification in the first sentence following the TITLE.

Respectfully submitted,

Dated: Februiary 20, 2002

F. David AuBuchon
Reg. No. 20,493
Attorney for Applicant

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
Chicago, Illinois 60610
(312) 321-7738

APPENDIX for Preliminary Amendment for U.S Application Serial No. _____;
Attorney Docket 1284/3

In the Specification:

Please amend page 1 by inserting the following paragraph immediately following the TITLE:

This application is a nationalization of and claims priority under PCT Application No. PCT/SE00/00738 that was filed on April 18, 2000. This application was published, in accordance with PCT Article 21(2), in the English language as WO 00/63124 on October 26, 2000. PCT Application No. PCT/SE00/00738 claimed priority under Swedish Patent Application No. 9901377-3 that was filed on April 19, 1999.

Applicant or Patentee: Anders Lundquist
Serial or Patent No:
Case No.: 11294-3
Filed or Issued: October 19, 2001
For: METHOD AND DEVICE FOR CLEANING AND DISINFECTING TREATMENT OF WATER

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS
(37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled METHOD AND DEVICE FOR CLEANING AND DISINFECTING TREATMENT OF WATER described in

☒ the specification filed herewith.

☐ application serial no. _____, filed _____.

☐ patent no. _____, issued _____.

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

☒ no such person, concern or organization.

☐ persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

FULL NAME Anders Lundquist
ADDRESS Skatuddsvagen 3, SE-760, 45 Grisslehamn SWEDEN

☒ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

FULL NAME
ADDRESS

☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

FULL NAME
ADDRESS

☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Signature of Inventor	Signature of Inventor	Signature of Inventor
Name of Inventor: Anders Lundquist	Name of Inventor	Name of Inventor
Date:	Date	Date

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
Chicago, Illinois 60610
(312) 321-4200

Applicant or Patentee: Anders Lundquist
Serial or Patent No: 10/030,511 Case No.: 11284/3
Filed or Issued: October 19, 2001
For: Method and Device for Cleaning and Disinfecting Treatment of Water

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled Method and Device for Cleaning and Disinfecting Treatment of Water described in

☐ the specification filed herewith.

☒ application serial no. 10/030,511, filed October 19, 2001.

☐ patent no. _____, issued _____.

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

☒ no such person, concern or organization.

☐ persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

FULL NAME Anders Lundquist
ADDRESS Skatuddsvagen 3, SE-760 45 Grisslehamn, SWEDEN

☒ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

FULL NAME _____
ADDRESS _____

☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

FULL NAME _____
ADDRESS _____

☐ INDIVIDUAL ☐ SMALL BUSINESS CONCERN ☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Signature of Inventor	Signature of Inventor	Signature of Inventor
Name of Inventor: Anders Lundquist	Name of Inventor	Name of Inventor
Date: 3 April 2002	Date	Date

BRINKS HOFER GILSON & LIONE
P.O. BOX 10395
Chicago, Illinois 60610
(312) 321-4200

Method and device for cleaning and disinfecting treatment of water

The present invention concerns a method and a device for cleaning and disinfecting treatment of water, during which the water is subjected to an electric field.

During such methods that are currently known, a current is normally lead through the water that is to be treated, which leads to various electrochemical reactions in the water. In this way ionic compounds, such as salts dissolved in the water that are often added in association with the cleaning/disinfecting, are dissociated, furthermore, ions can be released from either or both of the electrodes, and the water itself can be decomposed into hydrogen gas and oxygen gas at the cathode and the anode, respectively. These reactions, and the current itself, have a killing effect on various micro-organisms in the water. Furthermore, the ionisation can lead to the aggregation of colloid particles and suchlike, which thus become easier to remove from the water.

An example of prior art of said kind is described in WO 86/01543: An electrode device for cleaning water in swimming pools has at least one copper electrode, and the current that is led between the electrodes is reversed at defined intervals. The only intervals of which examples are given are 22 and 25 seconds long. It is specified that the electrodes should be manufactured of a material that resists electrolysis. WO 86/01543 makes it also clear that silver must be added in cases where one wishes to combat micro-organisms such as *coli* bacteria in the swimming pool, for example by having one of the electrodes manufactured of silver or a combination of silver and copper. The device according to WO 86/01543 is fed with rectified current of a current strength that is not specified, and the time interval is regulated by an integrated time-control circuit of type LM 555.

It is desired in this context to achieve a technique of the aforementioned type that does not depend on the electrolysis of dissolved salts or the release of metal from the electrodes in order to achieve cleaning/disinfecting, in particular to avoid the use of silver, since not only is it well known that silver compounds are toxic also for humans, but also it clearly involves a significant cost, since silver usually commands a high price.

The present invention, which is defined by the attached claims, offers the possibility of fulfilling this desire. To be more precise, the present invention concerns a method for cleaning and disinfecting treatment of water, during which the water is subjected to at least one electric field by which the electric field is a low-current field with pulsating direct voltage. No silver is added to the water during the method, neither in the form of silver metal nor silver salts. The polarity of the low-current field is reversed at previously defined time intervals, which are up to about 20 seconds long.

One advantage of the method according to the invention is that it does not depend on the presence of substances dissolved or dispersed in the water, and thus the method is directly suitable for use on brackish water and fresh water. The effect of the methods can, however, be reinforced by the addition of, or the previous presence of, suitable substances.

The term "low-current field" is used in the present application to denote an electric field through which either no current or only low currents flow, whereby "low current" means, in agreement with SFS 1958:588, that the electric current does not have such a voltage, current strength or frequency that it can constitute a danger for people, pets or property. The maximum current strength of the electric field is preferably about 1 A, and its maximum voltage is preferably about 40 V. It should, however, be pointed out that the method is also effective in cases where the conducting element or elements that define the field do not exchange charge with the water. Thus the conducting elements that are used according to the invention can be essentially electrically insulated from the water, for example, by encasing those parts of the conducting elements that are placed in the water in an electrically insulating material, such as a plastic material. "Conducting element" should be understood here to denote an element that includes conducting material, but not necessarily an element that conducts an electrical current through the water. It is, on the other hand, preferable that a current does exist, that is to say, that the conducting elements are electrodes, whereby the method preferably includes an electrolytic reaction in the water.

"Pulsating" in the expressions "pulsating direct voltage" and "pulsating direct current" is used here to denote that the voltage/current occurs in pulses, such that the pulses are divided from each other by periods in which the voltage/current takes the value 0 or values close to 0. The pulses can have various shapes, for example, sawtooth, square, triangular or clipped sine waves such as those that are normally obtained when alternating current is rectified by means of a half- or full-wave rectifier. As has been specified above, the direct voltage/direct current can be made to change direction after a previously determined time period, which thus means that the direct voltage/direct current passes in only one direction during this period.

In one embodiment of the present invention, the electrical low-current field exists between two or more conducting elements, which are at least partly submerged in the water, whereby the conducting elements are preferably electrodes between which there flows a pulsating direct current with a current strength of a maximum of about 1 A.

In another embodiment of the present invention, the electrical low-current field is generated by electrical induction in one or several conducting elements that are located in a

rectified pulsating magnetic field, whereby the conducting elements are at least partly submerged in the water. The pulsating magnetic field can be brought to change direction after a previously determined time period which is up to about 20 seconds long, which thus results in the electrical low-current field also changing direction.

The present invention also concerns a device for the realisation of the first embodiment of the method according to the invention, in which the electrical low-current field exists between two or more conducting elements, which device includes:

- a source of pulsating direct voltage
- two or more conducting elements, which are connected in a conducting manner to the source of pulsating direct voltage and which are arranged to produce a low-current field with pulsating direct voltage between them; and
- means of changing in a time-dependent manner the direction of the pulsating direct voltage.

The source of pulsating direct voltage can be a conventional rectifier, for example of a half- or full-wave type, or it can be of the type that exists in the ignition systems of internal combustion motors. It can also consist of a mechanical or electronic device, or a combination of these, for conversion of a steady direct voltage to a pulsating one, for example, a relay or pilot switch suitable for the purpose.

The conducting elements lack any significant ability to release silver during the use of the device, and it is preferable that they do not contain any significant amounts of silver. On the other hand, they can contain or consist of copper or a copper alloy; steel or a steel alloy, preferably stainless steel; carbon, preferably in the form of graphite; or a combination of several of these materials.

The device is preferably arranged to create a low-current field of a maximum of 1 A between the conducting elements.

The device for changing the pulsating direct voltage in a time-dependent manner can consist of one or several mechanical or electronic devices, or combinations of these, for a regulation of the polarity of the current circuit in a time-dependent manner, which device may be of a *per se* known type.

Furthermore, the present invention also relates to a device for realisation of the second embodiment of the method according to the invention mentioned above, that is, the embodiment in which the electrical low-current field is produced by electromagnetic induction in one or several conducting elements that are located in a rectified pulsating magnetic field, which device includes:

- a source of a rectified pulsating magnetic field; and
- one or more conducting elements that is/are arranged in the pulsating magnetic field such that, when the device is in use, an electric field is produced around the conducting element or elements by electromagnetic induction.

This device preferably includes a vessel or pipe that is intended during use of the device to hold, or be flowed through by, the water that is to be cleaned/disinfected, whereby the source of the pulsating magnetic field is arranged outside of the vessel or pipe and the conducting element is arranged inside of it.

The source of the rectified pulsating magnetic field can consist of a winding of wires of conducting material, which winding can surround the conducting element or elements, or it may surround a preferably ring-shaped core of magnetic conducting material, preferably containing iron, which in turn surrounds the conducting element or elements, whereby a pulsating direct current flows through the winding, which pulsating direct current can be generated by a conventional rectifier, for example, of a half- or full-wave type, or achieved in a manner equivalent to that used in the ignition systems of internal combustion motors. The pulsating direct current can also be achieved with the aid of a mechanical or electronic device, or a combination of these, for conversion of a steady direct current to a pulsating direct current.

The conducting element or elements lack any significant ability to release silver during use of the device, and it is preferable that it/they do not contain any significant amounts of silver. On the other hand, it/they can contain or consist of copper or a copper alloy; steel or a steel alloy, preferably stainless steel; carbon, preferably in the form of graphite; or a combination of several of these materials.

The device is preferably arranged to produce a low-current field with a maximum strength of 1 A between the conducting elements.

The device for changing in a time-dependent manner the direction of the pulsating magnetic field may consist of a mechanical or electronic device, or a combination of these, for time-dependent regulation of the polarity of a current circuit, which device may very well be of a known type, for example, a relay or pilot switch that is suitable for the purpose, whereby the device is arranged to act on the pulsating direct current that provides input for the source of the rectified pulsating magnetic field.

The method and the devices according to the invention will now be illustrated by description of examples of particular embodiments and with reference to the attached drawings, in which:

Figure 1 is a sketch of the principle of an embodiment of the device for realisation of

the first-named embodiment of the invention,

Figure 2 is a schematic view, in partial cross-section, of an embodiment of the device for realisation of the second-named embodiment of the invention, and

Figure 3 is a schematic plan view of the same device as shown in Figure 2, also here in partial cross-section.

The device in Figure 1 includes a source 10 of pulsating direct voltage, two conducting elements 20, 30, connected in a conducting manner to the source 10, and a device 40 for changing the direction of the pulsating direct voltage in a time-dependent manner. The source 10 consists of a full-wave rectifier 50, which converts alternating current from the public electrical supply, which alternating current is input from a (not shown) transformer, into pulsating direct current. This direct current is fed by the wires 60, 70 and by the device 40 to conducting elements 20, 30. The device 40 includes a time-circuit 80, which consists of wires 90, 100, an electromagnet 110, and a time-switch 120, together with a resistor 130 that is arranged to short-circuit the electromagnet 110. The time-switch 120 is arranged to conduct current in previously determined time intervals either through the resistor 130 or through the electromagnet 110. The lengths of the intervals are calculated by the time-switch 120 based on the frequency of the pulsating direct current. When the current is led through the electromagnet 110, electrically and magnetically conducting tongues 131, 140, which are connected to the wires 60 and 70, are drawn towards and into contact with contact points 150 and 160, which are connected by wires to conducting elements 30 and 20, whereby the conducting element 20 receives a negative potential and the conducting element 30 in a similar manner receives a positive potential. In this way, the pulsating potential field that has been referred to is produced between the conducting elements 20, 30, which are partially submerged in the water that is to be cleaned, which in this case is placed in a container 170. In a similar fashion, when the time-switch 120 after a previously determined time, which has been calculated by the time-switch 120 based on the frequency of the pulsating direct current, short-circuits the electromagnet 110 across the resistor 130, then the conducting tongues 131, 140 will, due to the action of a (not shown) spring loading, be brought into contact with contact points 180 and 190, which are connected by wires to conducting elements 20 and 30, whereby the conducting element 20 receives a positive potential and the conducting element 30 in a similar manner receives a negative potential. In this way, the pulsating potential field that has been referred to is produced again between the conducting elements 20, 30, but now in the reverse direction.

The device in Figure 2 includes a source 200 for a rectified pulsating magnetic field,

in this case consisting of a ring-shaped iron core 220 around which an electrically insulated copper wire 210 has been wound, and a conducting element 230 of a stainless steel alloy. Inside the magnetic field that has been produced by the source 200 a flow-through vessel 240 is located, to which an infeed pipe 250 and an outfeed pipe 260 are connected. Inside the flow-through vessel 240, conducting element 230 is suspended in a netting bag 270, which is manufactured from a plastic material. During operation of the device, the water that is to be cleaned flows into the flow-through vessel 240 from the infeed pipe 250 and out from the said vessel through the outfeed pipe 260. As the water passes through the flow-through vessel 240, it is exposed to the pulsating direct voltage field that has been produced around the conducting element 230 by electromagnetic induction, in that a pulsating direct current flows through the iron core 220 around which an electrically insulated copper wire 210 has been wound. The pulsating direct current that is input to the copper wire 210, is produced in this case in the same way as in the device shown in Figure 1, and the pulsating magnetic field is caused to change direction at previously determined time intervals with the aid of a time-circuit and a time-switch of the same type as in the device according to Figure 1.

The method and the devices according to the invention have a large number of possible areas of application for one skilled in the art. Among these areas can be mentioned, for example, the cleaning/disinfecting of the water in swimming pools and of drinking water, and also the maintenance of the external surfaces of metal boat hulls. In the latter case, the pulsating direct current can be led either through the metal hull or using the metal hull as one of several conducting elements.

PCT/ SE 0 0 / 0 0 7 3 8
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Claims

1. Method for cleaning and disinfecting treatment of water, during which the water is subjected to at least one electric field, c h a r a c t e r i s e d in that the electrical field is a low-current field with pulsating direct voltage; that the pulsating direct voltage is made to change direction after a previously determined time period, which is up to about 20 seconds long; and that no silver is added to the water, and that the electrical low-current field is produced by electromagnetic induction in a conducting element located in a rectified pulsating magnetic field, whereby the conducting element is at least partially submerged in the water.

2. Method according to any of the preceding claims, c h a r a c t e r i s e d in that the water is brackish water or fresh water.

3. Method according to claims 1-2, c h a r a c t e r i s e d in that the pulsating magnetic field is caused to change direction after a pre-determined time period, which is up to about 20 seconds long.

4. Device for realisation of the method according to any of claims 1-3, c h a r a c t e r i s e d in that it includes:

- a source of a rectified pulsating magnetic field; and
- a conducting element, which lacks any significant ability to release silver during use of the device and which is arranged in the pulsating magnetic field such that an electric field is produced around the conducting element by electromagnetic induction during use of the device; and
- a device for changing the direction of the pulsating magnetic field in a time-dependent manner.

5. Device according to claim 4, c h a r a c t e r i s e d in that the device includes either a vessel which is intended during use of the device to be filled with the water that is to be cleaned/disinfected, or a pipe through which it is intended that the water that is to be cleaned/disinfected is to flow, whereby the source of the pulsating magnetic field is arranged outside of the vessel or pipe and the conducting element is arranged inside of it.

6. Device according to claim 4, c h a r a c t e r i s e d in that the device is arranged to achieve a low-current field of a maximum of 1 A around the conducting element.

7. Device according to claim 4, c h a r a c t e r i s e d in that the source of the rectified pulsating magnetic field includes a core of magnetic conducting material in the shape of a ring, around which is wound a wire of conducting material, through which wire pulsating direct current flows.

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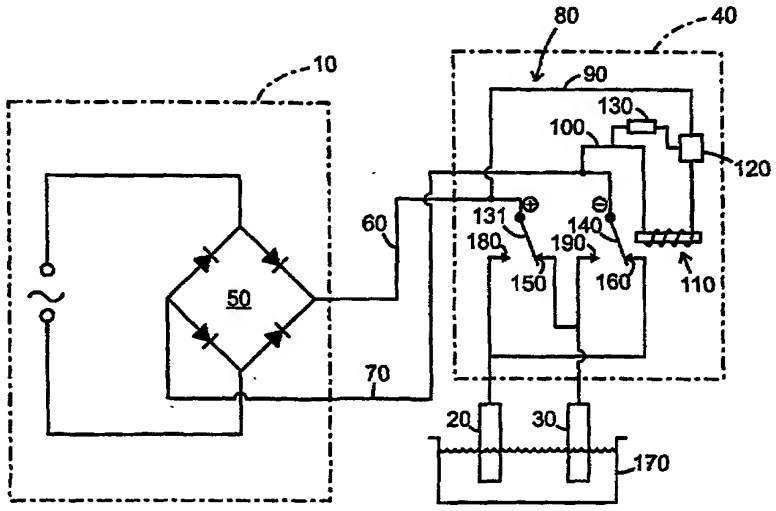

(57) Abstract

Method for cleaning and disinfecting treatment of water, during which the water is exposed to at least one electric field, whereby the electric field is a low-current field with pulsating direct voltage. Device for realisation of the method which includes a source of pulsating direct voltage; two conducting elements, which are connected in a conducting manner to the source of pulsating direct voltage and which are arranged to achieve a low-current field with pulsating direct voltage between them; together with a device for changing in a time-dependent manner the direction of the direct voltage. Device for realisation of the method which includes a source of a rectified pulsating magnetic field and a conducting element, which is arranged in the pulsating magnetic field such that, during operation of the device, an electric field is produced around the conducting element by electromagnetic induction.

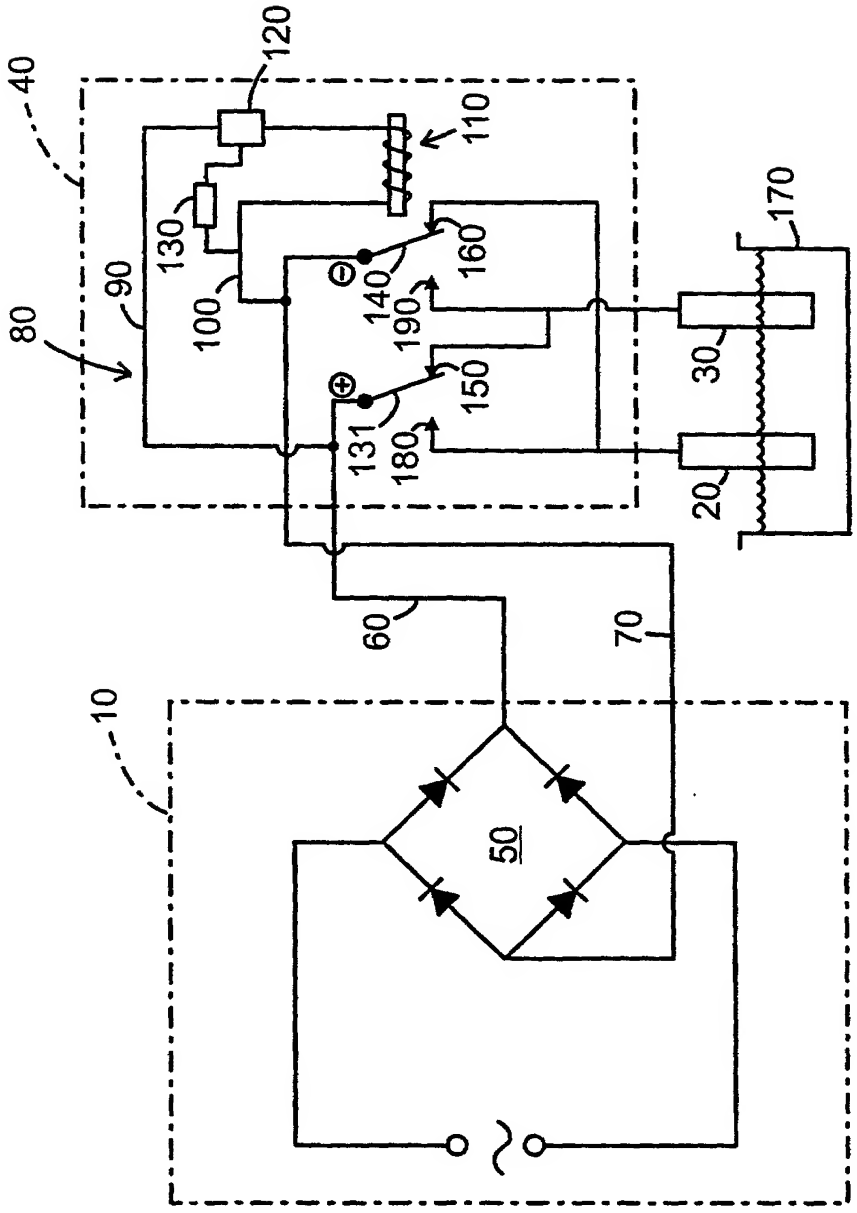
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FIG. 1

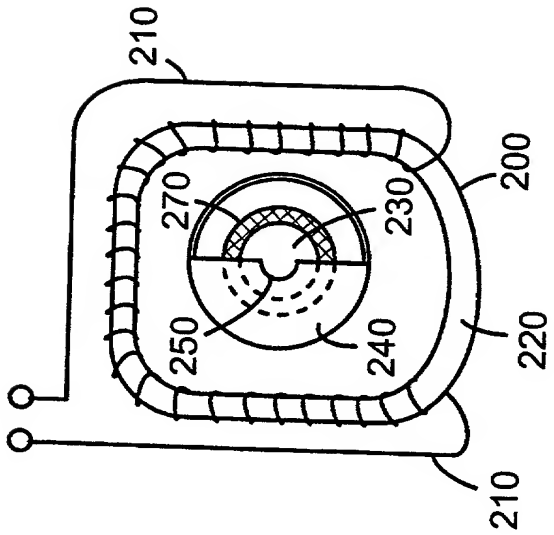
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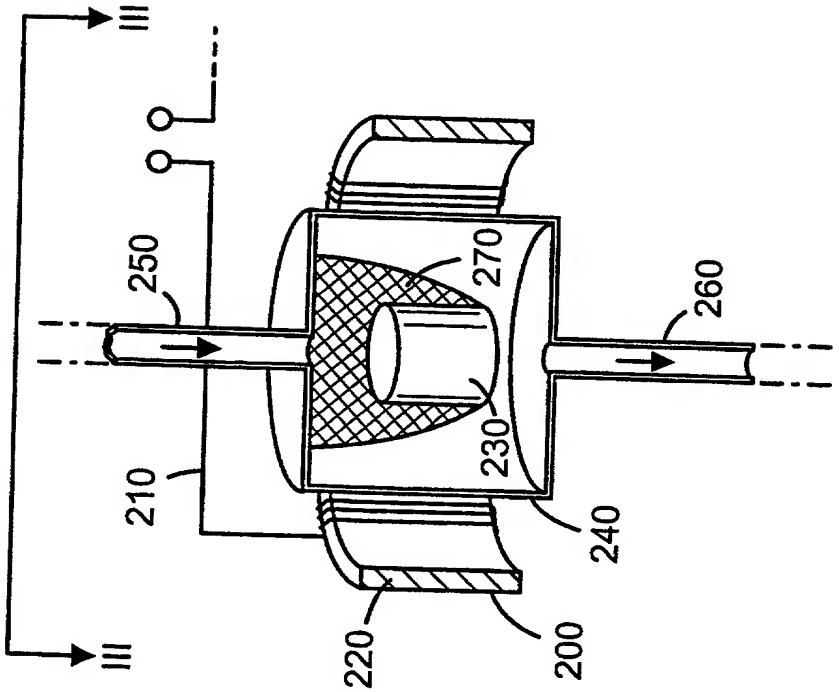
FIG. 3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III

FIG. 2

Case No. 11284/3

DECLARATION FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled Method and Device for Cleaning and Disinfecting Treatment of Water, the specification of which:

- ☐ is attached hereto.
- ☒ was filed on October 19, 2001 as Application Serial No. 10/030,511.
- ☒ and was amended on February 20, 2002 (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability as defined in Title 37, Code of Federal Regulations, § 1.56(a).

I hereby claim foreign priority benefits under 35 U.S.C. § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
No. 9901377-3	Sweden	19/4/1990	☒	☐
(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under 35 U.S.C. § 119(e) of any United States provisional application(s) listed below:

(Application Serial No.)	(Filing Date)

I hereby claim the benefit under 35 U.S.C. § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. § 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.)	(Filing Date)	(Status-patented, pending, abandoned)
PCT/SE00/00738	April 18, 2000	Completed

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Inventor's Signature Anders Lundquist Date: 3 April 2002

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Case No. 11284/3

Inventor(s): Anders Lundquist

Title: METHOD AND DEVICE FOR CLEANING AND DISINFECTING TREATMENT OF WATER

POWER OF ATTORNEY

The specification of the above-identified patent application:

☐ is attached hereto

☒ was filed on October 19, 2001 as application Serial No. 10/030,511

I hereby revoke all previously granted powers of attorney in the above-identified patent application and appoint the following attorneys to prosecute said patent application and to transact all business in the Patent and Trademark Office connected therewith:

3

F. David Aubuchon, ~~20,493~~
Richard K. Clark, ~~40,560~~
David Okey, 42, 959

Please address all correspondence and telephone calls to F. David Aubuchon in care of:

Brinks Hofer Gilson & Lione
NBC Tower, Suite 3600
P.O. Box 10395
Chicago, IL 60610
(312)321-4200

The undersigned hereby authorizes the U.S. attorneys named herein to accept and follow instructions from Anders Lundquist as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorney and the undersigned. In the event of a change in the persons from whom instructions may be taken, the U.S. attorneys named herein will be so notified by the undersigned.

Inventor (s) Anders Lundquist — Date: 3 April 2002

Inventor (s) — Date:

Inventor (s) — Date:

Rev. Dec.-99
Document5